

NOV 26 1995

## Computational Science 260

### Trial Exam

1. Let  $L$  be a list consisting of a mixture of numbers and other text, and let  $\text{number}(X)$  be a predicate which succeeds if  $X$  is a number. Write a Prolog predicate  $\text{total}(L, \text{Sum})$  which succeeds if the sum of all numbers contained in  $L$  is equal to  $\text{sum}$ .
2. Let  $a[i]$ ,  $i = 1..6$  be an array of integers in some computer language. Furthermore, let  $X$  be a set, containing 6 elements.
  - (a) Find a method to represent a function  $f : X \rightarrow \mathbb{N}$  by using only the array  $a$ .
  - (b) What data structure would you use to store the function  $f : X \times X \rightarrow Y$ .
3. Let  $A = \{a, c, d\}$ , and let  $B = \{c, d, e\}$ . Find  $\{x | ((x \in A) \vee (x \in B)) \wedge \neg(x \in A \cap B)\}$ .
4. Let  $R$  be a relation. Prove that  $R - R^\sim$  is always irreflexive and antisymmetric.
5. Functions are relations with special properties. List these properties. If  $f$  and  $g$  are two functions, is  $f \cap g$  also a function. Do this by verifying the properties of  $f \cap g$ .
6. What are the conditions that must be met in order for a partial function to have an inverse.
7. Create two relations  $R$  and  $S$  in roster notation, and find  $R \cup S$ ,  $R \cap S$ , and  $R \circ S$ .
8. At the end of the year, all the grades of all classes a student took are recorded. Design a Z schema which allows you to find what grade a student ~~obtain~~ <sup>obtained</sup> in any give class. Work out all the exceptions as well.